

# NOTES 19: CLT-BASED INFERENCE FOR PROPORTIONS

Stat 120 | Fall 2025

Prof Amanda Luby

---

**CLT:** The Central Limit Theorem (CLT) tells us that if the sample size is big enough and the sample is random,

$$\bar{X} \sim N(\text{____}, \text{____})$$

$$\hat{p} \sim N(\text{____}, \text{____})$$

The general form for a **confidence interval** is:

**Example:** Finding  $z^*$

- 95% confidence interval
- 68% confidence interval
- 99% confidence interval
- 90% confidence interval

## 1 How big is big enough?

**Example 1:**  $\hat{p} = .5$

**Example 1:**  $\hat{p} = .05$

**i** Note

### Rule of Thumb for Proportions:

- Expected count in each category (Yes/No) should be  $> \text{____}$
- $np > \text{____}$  and  $n(1-p) > \text{____}$

## 2 How do we find the SE?

**i** Note

### Standard Error for Proportions:

**Idea:** As  $n$  gets bigger, the SE gets \_\_\_\_\_. If  $\hat{p}$  is close to .5, the SE is \_\_\_\_\_ than if  $\hat{p}$  is close to 0 or 1

**Example:** ESP Example Again

$n = 14$

```
p_hat = 3/14
n = 14
SE_p = sqrt((p_hat*(1-p_hat))/n)
z_score = (p_hat - .2)/SE_p
p_val = pnorm(z_score, lower.tail = FALSE)
p_val
```

[1] 0.4482

$n=1400$ :

$n=14000$ :

**Big Picture** Picture